

MEMORANDUM FOR DR. A. D. HOPKINS.

INTER-RELATIONS OF FOREST FIRES AND INSECTS.

DATA FOR 1919.

MISTLETOE BURN.
SISKIYOU BURN.

J E Patterson
Ashland, Oregon.
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1921.

CONTENTS.

	Page:
FOREWORD	1
MISTLETOE BURN	2
Burned area	2
Basal Fire Scars	2
Fire Damage	3
Classification of Fire Injured Trees	3
Trees Infested in 1919	3
Volume Table of Trees Attacked in 1919	4
Volume Table of 1919 Loss in Burn	4
Summary of Infestation on Burned Area	5
Area Surrounding Burn	6
1919 Infestation on Area	6
Table of Annual Losses	6
Cycle of Infestation	7
SISKIYOU BURN	8
Burned Area	8
Basal Fire Scars	8
Fire Damage	8
Trees Infested in 1919	8
Volume Table of Trees Attacked in 1919	9
Volume Table of 1919 Loss in Burn	9
Summary of Infestation on Burned Area	10
Area Surrounding Burn	11
1919 Infestation on Area	11
Table of Annual Losses	11
Cycle of Infestation	11
SUMMARY OF 1919 DATA	12
Mistletoe Burn	12
Siskiyou Burn	14
RECOMMENDATIONS REGARDING CONTINUATION OF STUDY	15
MAPS (In pocket)	16

MEMORANDUM FOR DR. A. D. HOPKINS.

INTERRELATION OF FOREST FIRES AND FOREST INSECTS.

MISTLETOE AND SISKIYOU BURNS.

DATA FOR 1919.

FOREWORD.

Investigations of forest fires as related to forest insects were continued at the Ashland Station during the season of 1919. These investigations were devoted to a continuation of the studies on the Mistletoe and Siskiyou burns in the Rogue River Area, Ore.

A preliminary report on these burns entitled, "Interrelation of Forest Fires and Insects; Data for 1918 on the Mistletoe and Siskiyou Burns", was submitted May 7, 1919. This report gave the history of the burns, the infestation preceding and after the fires both on the burned areas and in the surrounding forests, the development of insect broods in the fire damaged trees and other data pertaining to the study.

The following memorandum gives the 1919 data on these burns and is intended to supplement the preliminary report issued in May 1919.

The 1919 investigations consisted of an intensive cruise of the burned areas and an intensive cruise of the Siskiyou, Mistletoe, Lamb's and Ashland units. The essential points aimed at were the determination of the amount of infestation developed

in 1919 on the burned areas and in the surrounding forests and the rate of dispersion of the infestation concentrated in 1918 in the burns to the outlying forested areas. A final analysis of fire injury was also made to determine the number of trees which died subsequent to the 1918 cruise from results of fire injury alone. In the intensive cruise of 1919 no notes were made of basal fire scars on the fire injured trees. In making a complete analysis of the fire damage this type of injury should be given attention. Therefore in the intensive cruise of the burned areas made in the spring of 1919 all basal fire scars on trees 10 inches in diameter and above were recorded.

In the following memorandum the two burns will be taken up separately. The data in hand brings the study up to May 19120.

MISTLETOE BURN.

Data for 1919.

Basal Fire Scars:

The following table shows the number of trees damaged by this type of injury:

:	:	:	:
: Size of scar :	Yellow pine	:	Sugar pine :
:	Number of trees	:	Number of trees:
:	:	:	:
: Small :	134	:	0 0 :
: Medium :	142	:	3 0 :
: Large :	129	:	4 :
: Totals :	405	:	7 :

Fire Damage:

Trees that died from fire injuries only and subsequent to the 1918 cruise:

Class	No. of trees	Volume B.F.
I	0	0
III	0	0
IV	0	0
V	5	2,980
Total	5	2,980

I Infestation Developed in 1919 on the Burned Area.

Classification of Fire Injured Trees:

- Class I - Green trees, uninjured by fire.
- Class II - Trees killed by fire.
- Class III - Light burn, trunk and lower limbs scorched.
- Class IV - Medium burn, nearly all foliage scorched.
- Class V - Heavy burn, trunk scorched and foliage burned off.

Trees Infested in 1919:

Yellow pine.

Class of fire injury	No. trees	Volume	Percent of infestation of each class.
			No. trees 1: Volume B.Fo:
Class I	21	16,050	42.%
Class III	11	8,260	22.%
Class IV	13	12,460	26.%
Class V	5	4,710	10.%
Total	50	41,480	100.%

Sugar pine : Class III : 1 : 700 : 100.%

Volume Table of Class of Trees Attacked in 1919.

: Yellow pine.									
: Diam:Unit	: Class I	: Class III	: Class IV	: Class V					
: inch:Volume:	No.	Volume:	No.	Volume:	No.	Volume:	No.	Volume	
: 10 :	100:	2	200:		: 1	100:			
: 12 :	120:	4	480:	3	360:				
: 14 :	140:	1	140:	3	420:				
: 16 :	160:	1	160:						
: 18 :	220:			1	220:				
: 20 :	260:	1	260:	1	260:		1	260	
: 24 :	480:	4	1,920	1	480:	4	1,920:	1	480
: 26 :	700:				: 3	2,100:			
: 28 :	970:	1	970:		: 1	970:	1	970	
: 30 :	1170:	3	3,510:		: 2	2,340:			
: 32 :	1500:	1	1,500:				2	3,000	
: 34 :	1860:	1	1,860:						
: 36 :	2110:	1	2,110:		: 1	2,110:			
: 40 :	2920:	1	2,920:		: 1	2,920:			
: 42 :	3260:			2	6,520:				
: Totals	: 21	16,050:	11	8,250:	13	12,460:	5	4,710	
: Sugar pine.									
: 26 :	700:			1	700:				
: Total				1	700:				

Volume Table of the 1919 Loss Inside Burned Area:

: Infestation in Y. pine : Sugar pine : Total infestation :									
: Diam:Unit	: D.brey	: Igen:	: D.brey	: 2gen :	: D.monticolae:	: both hosts			
: inch:volume:	No.	Volume:	No.	Volume:	No.	Volume :	No.	Volume	
: 10 :	100:	1	100:	2	200:		: 3	300:	
: 12 :	120:	5	600:	2	240:		: 7	840:	
: 14 :	140:	3	420:	1	140:		: 4	560:	
: 16 :	180:	1	180:				: 1	180:	
: 18 :	220:	1	220:				: 1	220:	
: 20 :	260:	2	520:	1	260:		: 3	780:	
: 24 :	480:	6	2,880:	4	1,920:		: 10	4,800:	
: 26 :	700:	2	1,400:	1	700:	1	700:	4	2,800:
: 28 :	970:	3	2,910:				: 3	2,910:	
: 30 :	1170:	3	3,510:	2	2,340:		: 5	5,850:	
: 32 :	1500:	3	4,500:				: 3	4,500:	
: 34 :	1860:			1	1,860:		: 1	1,860:	
: 36 :	2110:	1	2,110:	1	2,110:		: 2	4,220:	
: 40 :	2920:			2	5,840:		: 2	5,840:	
: 42 :	3260:	2	3,260:				: 2	3,260:	
: Totals	33	25,870:	17	15,610:	1	700:	51	42,180:	

Summary of Infestation on Burned Area, 1917, 1918 and 1919 Losses.

Year of loss and Insect Responsible:	Annual Loss		Total Loss	
	No.	Volume:	No.	Volume:
Dendroctonus brevicomis 1917 1st generation in Yellow pine	2	1,150:		
D. brevicomis 1917 2nd generation in Yellow pine	17	11,530:		
D. monticolae 1917 generation in Yellow pine	1	100:		
			20	12,880:
D. brevicomis 1918 1st generation in Yellow pine	157	105,000:		
D. brevicomis 1918 2nd generation in Yellow pine	53	35,400:		
D. monticolae 1918 generations in Yellow pine	5	3,190:		
Melanophila sps. in Yellow pine	5	980:		
D. monticolae 1918 generations in Sugar pine	22	15,150:		
			242	159,720:
D. brevicomis 1919 1st generation in Yellow pine	33	25,870:		
D. brevicomis 1919 2nd generation in Yellow pine	17	15,610:		
D. monticolae 1919 generations in Sugar pine	1	700:		
			51	42,180:

Year of loss	No.	Volume:	Increase or decrease over	
			preceding year in volume BF	
			Increase	Decrease
1917 - Before fire	20	12,880:		
1918 - After fire	242	159,720:	1140.%	
1919 - After fire	51	42,180:		74.%

AREA SURROUNDING BURN.

The 1919 Infestation In Area Surrounding Burn:

Unit	D. brevicornis 1919 1st and 2nd genrs. in Yellow pine	No. trees	Volume in BF
Siskiyou	87	91,750	
Mistletoe	45	37,110	
Lamb's	46	31,550	
Ashland	46	38,800	
Total	224	199,210	

Annual Losses in Area Surrounding Burn. 1917 to 1919 Inclusive.

Unit	Year of loss	Annual loss	No. trees	Volume	Increase or decrease over preceding year in volume	BF
					Increase	Decrease
Siskiyou	1917	97	137,810			
	1918	128	164,450	19.%		
	1919	187	91,750			38.%
Totals		312	394,010			
Mistletoe	1917	160	93,470			
	1918	95	81,250		13.%	
	1919	45	37,110			54.%
Totals		298	211,830			
Lamb's	1917	76	56,200			
	1918	82	69,150	23.%		
	1919	46	31,550			54.%
Totals		204	156,900			
Ashland	1917	116	116,190			
	1918	205	201,260	74.%		
	1919	46	38,800			80.%
Totals		367	356,270			

Cycle of Infestation in Surrounding Area; 1917 to 1919 Inclusive.

		: Annual loss		: Increase or decrease over	
: Year of:	No. trees:	Volume:	preceding year in volume	:	:
: 1917	: 449	: 403,670:	Increase	: decrease	:
: 1918	: 508	: 516,130:	28.7%	:	:
: 1919	: 224	: 119,210:	:	: 77.7%	:
: Totals	1181	: 1,039,010:	:	:	:

SISKIYOU BURN.

Data for 1919.

Basal Fire Scars:

The following table shows the number of trees damaged by this type of injury.

:	:	:	:
: Size of scar :	Yellow pine	: Sugar pine	:
:	Number of trees:	Number of trees	:
:	:	:	:
: Small :	103	: 2	:
: Medium :	83	: 1	:
: Large :	81	: 4	:
: Totals :	267	: 7	:

Fire Damage:

Trees that died from fire injury only and subsequent to the 1918 cruise:

:	:	:	:
: Class :	No. of trees	: Volume in B.F.:	:
:	:	:	:
: I :	0	: 0	:
: III :	0	: 0	:
: IV :	0	: 0	:
: V :	10	: 3.300	:
: Total :	10	: 3.300	:

Infestation Developed in 1919 on
the Burned Area:

Trees Infested in 1919:

Yellow pine

:	:	:	:	:
: Class of :	:	: Percent of infestation	:	:
: fire injury:	No. trees	: Volume	: of each class	:
:	:	: No. trees	: Volume	:
: Class I :	2:	2.370:	3.%	: 3.%
: Class III :	15:	13.050:	24.%	: 17.%
: Class IV :	6:	2.250:	10.%	: 3.%
: Class V :	39:	57.320:	63.%	: 77.%
Sugar pine :	Class V	1:	480:	100. : 100

Volume Table of Class of Trees Attacked in 1919:

Yellow pine.									
:Diam:	Unit :	Class I		Class III		Class IV		Class V	
:inch:	Volum:	No.	Volume	No.	Volume	No.	Volume:	No.	Volume
: 10 :	100:								
: 12 :	120:			8	960:	3	360:	7	840:
: 16 :	180:			2	360:				
: 18 :	220:					1	220:	4	880:
: 20 :	260:	1	260:	1	260:			2	520:
: 22 :	380:							1	380:
: 24 :	480:							6	2,880:
: 26 :	700:			1	700:	1	700:	2	1,400:
: 28 :	970:					1	970:		
: 30 :	1170:			1	1,170:			4	4,680:
: 32 :	1500:							2	3,000:
: 36 :	2110:	1	2,110:					4	8,440:
: 40 :	2920:							2	5,840:
: 42 :	3260:							2	6,520:
: 48 :	4800:			2	9,600:			2	9,600:
:64 :	12340:							1	12,340:
: Totals :		2	2,370:	15	13,050:	6	2,250:	39	57,320:
Sugar pine									
: 24 :	480:							1	480:
: Total :								1	480:

Volume Table of the 1919 Loss Inside Burned Area:

		Infestation in yellow pine				Sugar pine		Total infest.:	
Diam:Unit :		D.brev 1st gen:		D.brev 2nd gen:		D.monticolae		both hosts.	
:inch:	Volume:	No.	Volume:	No.	Volume	No.	Volume	No.	Volume
: 12 :	120:	10	1,200:	8	960:			18	2,160:
: 16 :	180:	2	360:					2	360:
: 18 :	220:	4	880:	1	220:			5	1,100:
: 20 :	260:	3	780:	1	260:			4	1,040:
: 22 :	380:			1	380:			1	380:
: 24 :	480:	6	2,880:			1	480:	7	3,360:
: 26 :	700:	3	2,100:	1	700:			4	2,800:
: 28 :	970:	1	970:					1	970:
: 30 :	1170:	5	5,850:					5	5,850:
: 32 :	1500:	2	3,000:					2	3,000:
: 36 :	2110:	5	10,550:					5	10,550:
: 40 :	2920:	1	2,920:	1	2,920:			2	5,840:
: 42 :	3260:	2	6,520:					2	6,520:
: 48 :	4800:	4	19,200:					4	19,200:
: 64 :	12340:	1	12,340:					1	12,340:
: Totals :		49	69,550:	13	5,440:	1	480:	63	75,470:

Summary of Infestation on Burned Area; 1918 and 1919 Losses.

Year of Loss and Insect Responsible:	Annual Loss		Total Loss	
	No.	Volume:	No.	Volume
D. brevicomis 1918 1st generation in yellow pine	2	260:		
D. brevicomis 1918 2nd generation in yellow pine	38	43,770:		
D. monticolae 1918 infestation, generation in yellow pine	3	360:		
D. monticolae 1918 generation in sugar pine	9	1,580:		
			52	45,970:
D. brevicomis 1919 1st generation in yellow pine	49	69,550:		
D. brevicomis 1919 2nd generation in yellow pine	13	5,440:		
D. monticolae 1919 generations in sugar pine	1	480:		
			63	75,470:

Year of loss and generation insect	No.	Volume	Increase or decrease over preceding year in volume	
			Increase	Decrease
1918-1st, before fire	2	260:		
1918-2nd, after fire	50	45,710:	17500%	
1919 - after fire	63	75,470:	65%	

AREA SURROUNDING BURN.

The 1919 Infestation in Area Surrounding Burn:

: (Table on page 6) :

Annual Losses in Area Surrounding Burn. 1917 to 1919 Inclusive:

: (Table on page 6) :

Cycle of Infestation in Surrounding Area: 1917 to 1919 Inclusive:

: (Table on page 7) :

Note:

Tables indicated on this page are shown on pages 6 and 7 in section under Mistletoe Burn. The area referred to is the same in both instances, the data, of course, being identical.

SUMMARY OF 1919 DATA.

The study of the Mistletoe and Siskiyou burns in the Rogue River Area was continued in 1920. The data obtained this year applied to the 1919 infestation on these burned areas and in the area surrounding them.

The preceding memorandum of 1919 data is intended to supplement the preliminary report on these burns submitted May 7, 1919.

MISTLETOE BURN.

Damage Caused by the Fire:

With the completion of the 1920 field work final data on this phase of the problem become available.

An analysis of the fire damage as given in the preliminary report is shown as:

Less than 1.% of the stand was killed outright.

Only 6.5% of the stand was injured so that recovery was doubtful.

In 23.6% scorching of the foliage was noticeable but was not enough to interfere with the output of new growth the following season.

The remainder of the stand (65%) was uninjured by fire.

The 1919 data allows the following definite conclusions:

All the trees in classes I, III and IV fully recovered from fire damage.

In class V (heavy fire injury) 5 trees or .03% of the stand died since the first cruise in 1918 was made.

From the above statements it will be seen that the fire resulted in a very low percent of damage to the merchantable trees.

Data on basal scars caused by the fire was obtained in the 1920 cruise. The number and percent of trees bearing this type of is as follows:

405 trees or 27.% of total number of trees on the burned area were thus injured.

Development of Infestation After Fire.

On Burned Area:

	<u>trees</u>	<u>volume.</u>
Loss in 1917 (before fire)	20	12,500
Loss in 1918 (after fire)	242	159,720
Loss in 1919 (after fire)	51	42,180

This shows that the infestation during the season following the fire increased more than 1100% and that during the second season following the fire it was still 237% greater than the annual loss preceding the fire, but had decreased 74% of the annual loss during the season immediately following the fire.

On Area Surrounding Burned Area:

Taking the entire surrounding area as a unit the losses for the period of these investigations were:

	<u>Trees</u>	<u>Volume.</u>
Loss in 1917 (before fire)....	449 ...	403,670
Loss in 1918 (after fire)	508 ...	516,130
Loss in 1919 (after fire).....	224 ...	119,210

This shows that the infestation during the season immediately following the fire increased 28.% in volume and that during the second season following the fire it decreased 77.% in volume from the first seasons losses and 70.% from the season preceding the fire. Thus it will be seen that the infestation over the entire area has not yet regained the relative status which existed before the fire but is indicative that this condition is gradually being reached.

Attraction of Fire Injured Trees.

The 1919 infestation occurred in the following classes of trees:

42%	of	attacks	occurred	in	trees	of	Class	I	(trees	not	injured	by	fire)
48%	"	"	"	"	"	"	"	"	"	"	"	"	"
10%	"	"	"	"	"	"	"	"	"	"	"	"	"

"III & IV (trees moderately injured by fire)
" V (trees whose foliage was entirely burned but cambium green)

All of these trees put out normal broods from 1919 attacks.

SISKIYOU BURN.

Damage Caused by the Fire:

An analysis of the fire damage as given in the preliminary report is shown as:

3% of the stand was killed outright by the fire.

20% was injured so that recovery was doubtful.

In 46% scorching of the foliage was noticeable but the injury was not enough to interfere with the output of new growth the following season.

The remainder of the stand (31%) was uninjured by the fire.

Conclusions based on the 1919 data are:

All trees in classes I and III and IV fully recovered from fire injury.

In class V (heavy injury) 10 trees or 1.7% of the stand died subsequent to the preliminary cruise made in 1918.

Thus it will be seen that 4.7% of the stand was killed by the fire.

274 trees or 46.% of the total number on the burned area was injured by basal fire scars.

Development of Infestation After Fire.

On Burned Area:

	<u>Trees.</u>	<u>Volume.</u>
Loss in 1918 (before fire)	2	230
Loss in 1918 (after fire)	50	45,710
Loss in 1919 (after fire)	63	75,470

This shows that the infestation during the remainder of the season of 1918, the season in which the fire occurred, increased more than 1700% and that during the second season following the fire it still further increased 65% over the ~~xxx~~ first seasonal loss following the fire.

On Area Surrounding Burned Area:

As the Siskitow Burn is located only 4 miles distant from the Mistletoe Burn it is situated in the same general area. Conditions on this surrounding area both preceding and after the two fires occurred are directly applicable to both burns. Data given on the surrounding forested area for the Mistletoe burn applies also to the Siskitow burn.

Attraction of Fire Injured Trees.

The 1918 and 1919 infestation occurred in the following classes of trees:

	<u>1918</u>	<u>1919</u>
Attacks on trees of Class I	5%	3%
Attacks on trees of Class II	15%	0%
Attacks on trees of Class III	20%	24%
Attacks on trees of Class IV	15%	10%
Attacks on trees of Class V	45%	63%

All of the trees attacked in 1919 put out normal broods.

Recommendations Regarding Continuation of the Study.

It is recommended that the study be given attention for two years more. The field work may consist of annual intensive surveys of the burned areas to determine the amount of annual losses and the status of infestation. The surrounding area should be surveyed annually by either intensive cruises or the topographic viewing method to determine the amount of the annual losses.

With the completion of data on the 1920 and 1921 status of the infestation both on and surrounding the burned areas it is believed that final and definite conclusions on all phases of the problem may be drawn and a complete report be made possible.

Respectfully submitted;

H. Patterson
Entomological Ranger.

March 21, 1921.
Ashland, Oregon.